PCT/CA2004/001878
30 decembre 2004 (30.12.2004)

PA 1261791

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

December 21, 2004

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: ***60/514,004***
FILING DATE: ***October 27, 2003***

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

M. Sias

M. SIAS
Certifying Officer

16698 U.S.PTO

PTO/SB/16 (08-03)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

22141 U.S.PTO 60/514004 102703

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No.

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
MARCELLIN	BRUNEAU	Rouyn-Noranda, (Québec) CANADA

Additional inventors are being named on the _____ *separately numbered sheets attached hereto*

TITLE OF THE INVENTION (500 characters max)

UNIVERSAL GROUND ANCHOR SUPPORT FOR MINE SHAFT

Direct all correspondence to: **CORRESPONDENCE ADDRESS**

☑ Customer Number: 23863

OR

☐ Firm or Individual Name					
Address					
Address					
City		State		Zip	
Country		Telephone		Fax	

ENCLOSED APPLICATION PARTS (*check all that apply*)

☑ Specification *Number of Pages* 9
☑ Drawing(s) *Number of Sheets* 6
☐ Application Data Sheet. See 37 CFR 1.76
☐ CD(s), Number _____
☑ Other (specify) PTO-FB-235 (8-83)

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

☑ Applicant claims small entity status. See 37 CFR 1.27.
☑ A check or money order is enclosed to cover the filing fees.
☒ The Director is herby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 12-1110
☐ Payment by credit card. Form PTO-2038 is attached.

FILING FEE Amount ($)
$80.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☑ No.
☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____

[Page 1 of 2]

Respectfully submitted,

SIGNATURE _____

TYPED or PRINTED NAME François MARTINEAU

TELEPHONE 514-861-4831

Date October 23, 2003

REGISTRATION NO. 33072 *(if appropriate)*

Docket Number: 2988-2

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

TITLE : UNIVERSAL GROUND ANCHOR SUPPORT FOR MINE SHAFT

This invention relates to the rock bolting industry, for reinforcing side walls – including ceilings - from recently made mine shafts, tunnels, or the like underground structures. Ground reinforcing and supporting means such as anchoring bolts, are conventionally used throughout the world, to support engineering structures such as tunnels, mines, retaining walls, water dams, and piers.

Conventional rock bolting unit anchors may include a bolt with expander plug leaves at one end portion, these leaves having an outer surface which is roughened by serrations. This roughening increases the friction between the anchor and the surface of the borehole in which the anchor is inserted. The inner surface of the leaves have a taper which matches the taper on the corresponding surface of the expander plug. On installation, the bolt or stud is torqued, which then draws the expander plug down into the anchor. The leaves expand in a radial outward direction and securely engage the surface of the borehole, which anchor then becomes locked.

Examples of various types of conventional rock bolting ground supports include threaded rock studs (with or without headed rock bolts), and mechanical anchors (with expansion shells). In the industry, there are in particular five types of rock bolting units that are available : the rockbolt, the ''Rebar'', the split-set, the Swoelex and the cable-bolt. The rockbolt is probably the most ancient, which uses a

simple shaft with a shell, so as to maintain the rock wall in place. The rockbolt type of support has important drawbacks, in particular in that it is maintained in contact with the rock wall solely at its outer end portion, and its resistance varies with the type of ground material to be solidified.

The Rebar type of ground support consists of a shaft with a spiralling external wall. The Rebar support may be for example threaded, with a forged head or made from fiberglass. After a borehole has been made in the rock wall, warm resin sticks need to be installed before the rebar support is rotatively engaged forcibly. Once the resin cures, the rebar shaft becomes integral with the rock wall portion surrounding the borehole. Installation time is therefore high, and impractical in very cold subfreezing weather due to the need to keep the resin warm before and during insertion inside the rock borehole.

The split-set type of support consists of a tube which is diametrally slightly larger than the borehole, and which includes a lengthwise slit. As this tube is engaged into the borehole, the tube is interiorly compressed, thus supporting the adjacent rock formation. However, split-set supports have many drawback, including :

- they are rarely able to extend the full length of the borehole;
- they easily rust;
- they require a lot of clearance at the inner end of the borehole.

The swoelex type of support consists of a curved shaft which is lengthwisely interiorly inclined. Such support required a high output air pump, to inflate the shaft until it becomes complementary in shape to the borehole inner surface. Such support is very expensive, can rust, and is very expensive in labour costs and capital outlay.

The cable bolt type of support requires a borehole of a length between 12 and 200 feet. Steel balls are anchored at each 10 or 20 feet segments of the cable. An air pump and cement are required. It is very expensive in labour costs and capital costs.

There is therefore a need for a ground anchor support for mine shaft rock walls and the like, which will be adaptable for operational performance in a wide variety of contexts.

In the annexed drawings :

Figures 1 and 2 are sectional elevational views of an upright side wall from a mine shaft, each showing an anchor bolt having an inner end portion, inside the mine shaft wall rock and fitted with an expansion shell according to the prior art, and an outer end portion, projecting outwardly from the side wall rock;

Figures 3 and 4 are views similar to figures 1 and 2 respectively, but with the anchor bolt being fitted with a rock anchor support shown in lengthwise sectional view, according to the present invention;

Figure 5 is a longitudinal sectional view of a first embodiment of anchor support from figures 3 and 4;

Figure 6 is a cross-sectional view of the anchor support of figure 5;

Figures 7 and 8 are views similar to figures 5 and 6 respectively, but for a second embodiment of anchor support of the invention;

Figures 9 and 10 are views similar to figures 5 and 6 respectively, but for a third embodiment of anchor support of the invention;

Figures 11 and 12 are views similar to figures 5 and 6 respectively, but for a fourth embodiment of anchor support of the invention;

Figures 13 and 14 are views similar to figure 3, but showing two alternate embodiments of bolt and anchor support assemblies according to the invention;

Figure 15 is an enlarged plan view of the friction flair lock ring forming part of the anchor support of the invention;

Figures 16 and 17 are side edge views of the lock ring of figure 15, sequentially showing how the friction flairs can tilt under radial load and the lock ring becomes integral to the adjacent rock material in the rock cavity engaged by the anchor bolt; and

Figure 18 is a view similar to figure 3, but at a smaller scale and showing still another alternate embodiment of bolt and anchor support assembly according to the invention.

Figures 1 and 2 show a prior art type of rock bolting unit 20, for engagement into a borehole B made into the rocky material R of an upright side wall W from a mineshaft. Rock bolting unit 20 includes a cylindroid shaft 22, with an outer

threaded free end portion 24 for threaded engagement by a nut 26. Nut 26 is adapted to engage against the rocky wall surface W, with a bearing plate 29 preferably sandwiched therebetween. The inner portion of shaft 22 includes an inverted wedge piece 28freely partly engaged axially by a standard serrated expansion shell 30. The inner end of expansion shell 30 includes radially outwardly and endwisely inclined friction flairs 32. Shell 30 is slidable along wedge piece 28 to progressively move radially outwardly to become anchored to the inner surface of borehole B. Flairs 32 prevent shell 30 from receeding outwardly toward the borehole mouth Ba.

In accordance with the teachings of the invention, there is shown in figures 3-4 a rock bolting unit 20' including a shaft 22' with threaded outer end portion 24' and associated nut 26' and bearing plate 29'. The inner end portion of shaft 22' carries an annular sleeve 40 made from an elastomeric material, for example rubber or a resilient polymeric material. Sleeve 40 is diametrally larger than shaft 22', and is anchored thereto at the inner end thereof by a welded anchor plate 42. A second anchor plate 44 is slidably mounted to an intermediate section of shaft 22' , and adapted to be mounted to the inner end of sleeve 40 by a locking ring 46. Radially outwardly inclined friction flairs 48 are carried by plate 44, to prevent accidental egress motion of sleeve 40 once inside the borehole B. In operation, once end anchor plate 42 abuts against the inner end of the borehole wall B, by screwing nut 26' along threaded end portion 24' of shaft 22', the first anchor plate 42 compresses the sleeve 40 to deform radially outwardly, thus eventually coming to frictionally lockingly engage with the

side wall of the borehole B. Figure 4 shows the sleeve 40 being radially outwardly displaced at 40' after deformation following nut screwing of nut 26'.

Figures 5 and 6 show such a cylindroid elastomeric sleeve 40.

Figures 7 and 8 show an alternate cylindroid sleeve member 140, including a radially inner elastomeric tube 142 and a radially outward slitted metallic sleeve 144.

Figures 9 and 10 show an alternate cylindroid sleeve member 240, including a pair of relatively inverted interengaged wedge units 242 and 244. Radially outward wedge unit 242 is made from elastomeric material, for example a compressible material such as rubber or a soft polymer; whereas radially inward wedge unit 244 is a made from a rigid material, for example stainless steel, having a smooth outer surface for minimal frictional interaction with radially outward wedge unit 242.

Figures 11 and 12 show still another alternate cylindroid sleeve member 340, including :

a) a rigid radially outward tube 342, made for example of stainless steel, with tube 342 being slitted lengthwisely;

b) a rigid, non compressible radially inward tube 344, made preferably from a set polymeric material, and with smooth radially outward surface to minimize frictional interaction with the radially outward tube 342; and

c) a soft elastomeric tube 346, mounted radially intermediate the tubes 342 and 344.

Figure 13 shows an alternate rock bolting unit 400. Unit 400 includes a shaft 402 with a main portion 403 covered by a full length elastomeric sleeve 404 therealong. To the threaded inner end portion 406 of shaft 402 is threaded a nut 408, which is

destined to frictionally interlock with the rocky wall W via a bearing plate 410. Washers 412 and 414 are provided at the opposite ends of the shaft main portion 403. A standard expansion shell assembly 415 is axially mounted to the inner washer 412, while the outer washer 414 abuts against the rocky wall bearing plate 410. Friction flairs 416 project in radially outwardly inclined fashion from inner washer 412. Such an embodiment is particularly suitable to replace the rock bolting units of the rebar, rock-set or swellex types.

Figure 14 discloses still another alternate rock bolting unit 500. Unit 500 includes a shaft 502 with a main portion 503 covered by a full length elastomeric sleeve 504 therealong. To the threaded inner end portion 506 of shaft 502 is threaded a nut 508, which is destined to frictionally interlock with the rocky wall W via a bearing plate 510. Anti-egress lock rings 512 and 514 are provided both at the same inner end portion of the shaft main portion 503. An end plate 516 closes the inner end 502A of shaft 502, and is engaged by inner end lock ring 512. The outer end of elastomeric sleeve 504 abuts directly against the bearing plate 510. Such an embodiment is also suitable to replace the rock bolting units of the rebar, rock-set or swellex types.

Figures 15-17 show the friction flair discoid unit such as 48 in figures 3-4. Unit 48 includes a number of radially outwardly inclined bevelled tips 148, for example eight successively equidistant tips as illustrated. Each tip 148 may form a triangular integral extension from the periphery of discoid unit 48. Unit 48 is cut shaped, as illustrated in figure 16, with triangles 148 extending in a radially outwardly

inclined fashion, so that they may tilt under contacting load from the inner surface of the borehole B to become orthogonal as 148' to the general plane of the unit 48.

Figure 18 discloses an elongated threaded shaft 600 having an inner end portion 600A and an outer end portion 600B. An exposed rock side wall bearing plate 602 is locked about outer end portion 600B by a pair of screwing nuts 604, 606, meshing on threaded shaft 600 and taking the plate 602 in sandwich therebetween. A first expansion shell member 608 is mounted to the shaft inner end portion 600A, and a second expansion shell member 610 is mounted to a portion of shaft 600 spacedly intermediate the first expansion shell member 608 and the bearing plate 602. An elastomeric or soft polymeric sleeve 612 is mounted around shaft 600 and taken in contacting sandwich between intermediate expansion shell 610 and bearing plate inner nut 604. By selectively screwing the nuts 604 and 606, the expansion shells 608 and 610 are brought in operative diametrally enlarged rock anchoring condition. In the present invention, as in the other embodiments, the rubber sleeve 612 (or 40, 140, 240, 344, 404 or 504) is compressed under mechanical loads during underground support and retaining load induced stresses.

I CLAIM :

A rock bolting unit including a shaft with threaded outer end portion and associated nut and bearing plate, the inner end portion of said shaft carrying an annular sleeve made from an elastomeric material; said sleeve diametrally larger than said shaft, and anchored thereto at the inner end thereof by a welded anchor plate; a second anchor plate is slidably mounted to an intermediate section of shaft and adapted to be mounted to the inner end of sleeve by a locking ring; radially outwardly inclined friction flairs are carried by the plate to prevent accidental egress motion of sleeve once inside the borehole ; wherein in operation, once end anchor plate abuts against the inner end of the borehole wall, by screwing nut along threaded end portion of shaft , the first anchor plate compresses the sleeve to deform radially outwardly, thus eventually coming to frictionally lockingly engage with the inner side wall of the borehole .

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION
DECLARATION POUR DEMANDES DE BREVETS AVEC POUVOIRS

FRENCH LANGUAGE DECLARATION
form PTO-FB-235(8-83)

En tant qu'inventeur nommé ci-après, je déclare par les présentes que mon nom, mon domicile, mon adresse postale et ma nationalité sont ceux qui figurent ci-après. Je déclare que je crois être l'inventeur original, premier et unique (si un seul nom figure sur le présent acte) ou un des co-inventeurs, originaux et premiers (si plusieurs noms figurent sur le présent acte) du sujet revendiqué et pour lequel un brevet est demandé sur la base de l'invention intitulée :

As a below-named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name. I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled :

UNIVERSAL GROUND ANCHOR SUPPORT FOR MINE SHAFT

dont la description :
☐ est annexée aux présentes;
☐ a été déposée :
- ➢ Demande de brevet No. :
- ➢ Date de dépôt :

dont la description :
☒ is attached hereto;
☐ was filed:
- ➢ Patent application No.:
- ➢ Filing date:

Je déclare par les présentes avoir examiné et compris le contenu de la description identifiée ci-dessus, revendications y compris, et le cas échéant telle que modifiée par un amendement. Je reconnais le devoir de divulguer toute information qui soit en rapport avec l'examen de cette demande selon le titre 37 de la Codification des Règlements Fédéraux § 1.56(a). Je revendique par les présentes le bénéfice de priorité étrangère selon le titre 35 de la codification des États-Unis, § 119 de toute demande de brevet ou tout certificat d'auteur énuméré ci-après, et j'ai identifié également ci-après toute demande étrangère de brevet ou de certificat d'auteur ayant une date de dépôt antérieure à celle de la demande pour laquelle la priorité est revendiquée.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a). I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Demande(s) antérieure(s) dans un autre pays / *Prior foreign applications*:
- ➢ Pays / *Country*:
- ➢ Demande N° / *Serial N°*:
- ➢ Date de depot / *Filing date*:
- ➢ Revendication de priorité / *Priority claimed*:

Je reconnais le devoir de divulguer l'information pertinente selon le titre 37 de la codification des règlements fédéraux, § 1.56(a), sur toute information qui se présente entre la date de dépôt de la demande antérieure et la date de dépôt de cette demande, soit nationale, soit internationale PCT. Je déclare par les présentes que toutes mes déclarations, à ma connaissance, sont vraies et que toutes les déclarations faites à partir de

I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56 (a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made

renseignements ou de suppositions, sont tenues pour être vraies; de plus, toutes ces déclarations ont été faites en sachant que de fausses déclarations volontaires ou autres actes de même nature sont sanctionnés par une amende ou un emprisonnement, ou les deux, selon l'article 1001, du titre 18 de la Codification des États-Unis, et que des déclarations délibérément fausses peuvent compromettre la validité de la demande ou du brevet délivré.

with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statements may jeopardize the validity of the application or any patent issued thereon.

POUVOIR

En tant qu'inventeur, je désigne les agents de brevets suivants pour poursuivre la procédure de cette demande et traiter toute affaire la concernant par devant le bureau des brevets et marques:

François Martineau
Reg. N° 33072

Louis Martineau
Reg. N° 43676

Adresse postale :
François Martineau
LESPÉRANCE & MARTINEAU
1440, rue Sainte-Catherine Street Ouest
Suite 700
Montreal, (Quebec)
H3G 1R8 CANADA

Téléphone: (514) 861-4831
Téléfax: (514) 392-9112

Je nomme également comme représentant pour signification aux fins de recevoir tout avis affectant le brevet ou les droits en découlant :

Mr. Marvin Petry, de la firme
LARSON & TAYLOR
Transpotomac Plaza
1199, rue North Fairfax, Bureau 900
Alexandria, Virginia
États-Unis d'Amérique

Nom complet du seul ou **premier** inventeur:

Signature de l'inventeur :

Date : _____

Domicile :
Citoyenneté :
Adresse postale :

POWER OF ATTORNEY

As a named inventor, I hereby appoint the following patent agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

François Martineau
Reg. N° 33072

Louis Martineau
Reg. N° 43676

Send correspondence to:
François Martineau
LESPÉRANCE & MARTINEAU
1440, Saint-Catherine Street West
Suite 700
Montreal, (Quebec)
H3G 1R8 CANADA

Phone: (514) 861-4831
Fax: (514) 392-9112

I further appoint as domestic representative to whom may be served process or notice of proceedings affecting the patent or rights thereunder:

Mr. Marvin Petry, of the firm
LARSON & TAYLOR
Transpotomac Plaza
1199, North Fairfax St., #900
Alexandria, Virginia
USA

Full name of the sole or **first** inventor:

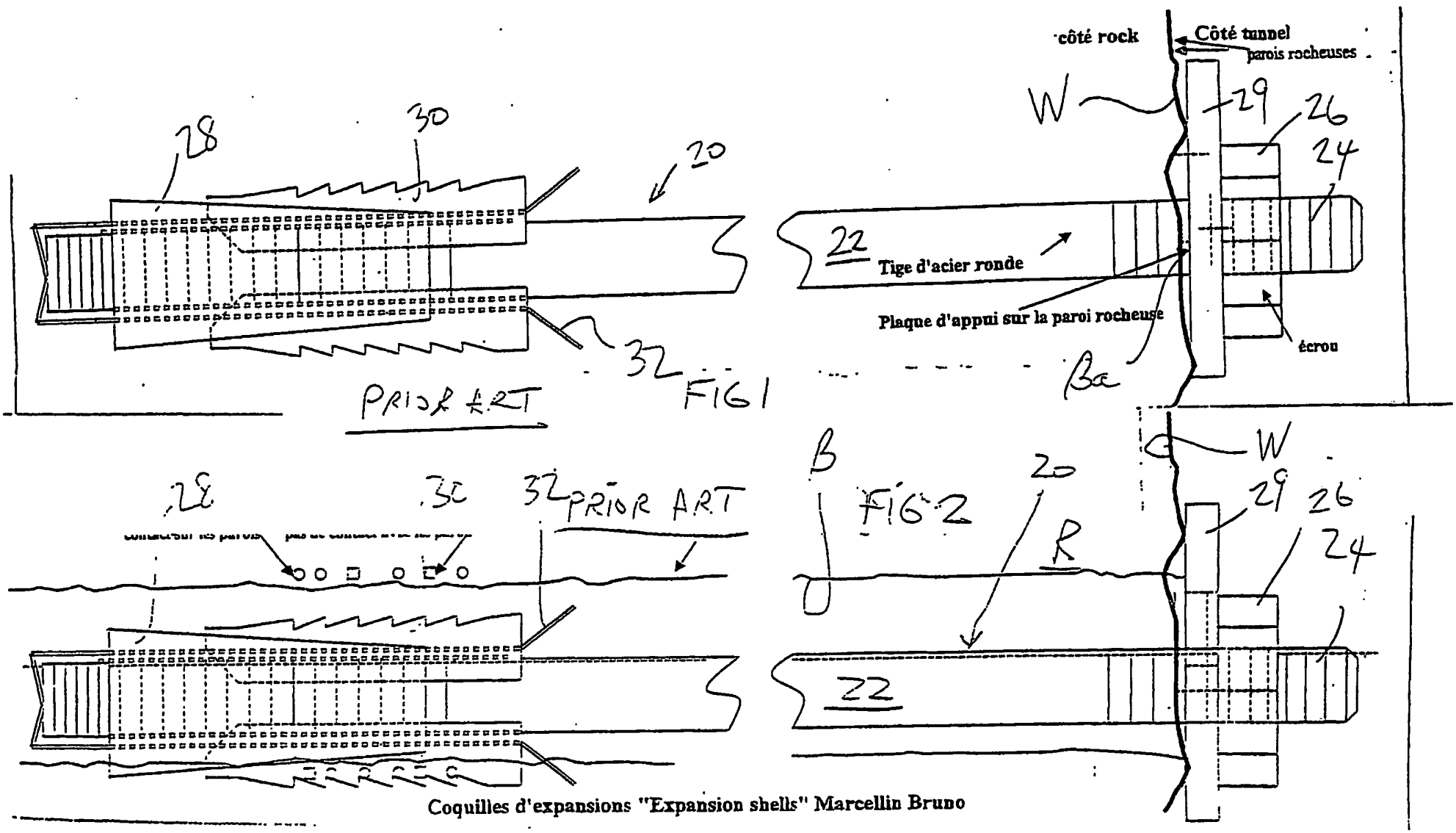
Marcellin Bruneau

Inventor's signature:

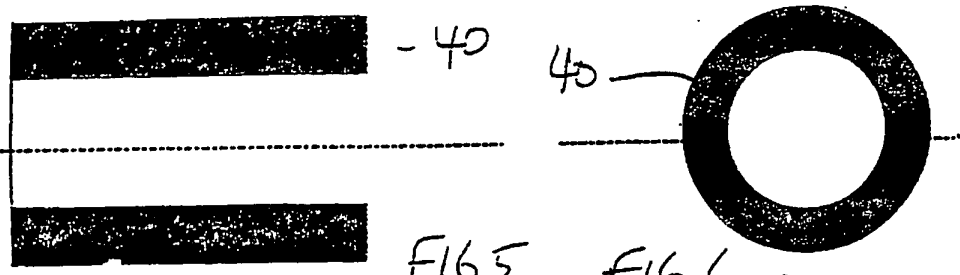
X _____

Date: 20/10/2003

Residence: Rouyn-Noranda, Quebec, Canada
Citizenship: Canadian
Post office address: 965, Quevillon St., C.P. 2296, Montbeillard, Rouyn-Noranda, Quebec, Canada, J9X 5A9

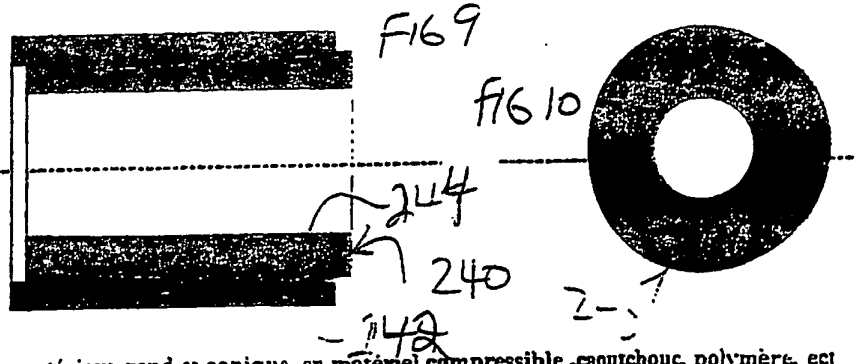


Coquilles d'expansions "Expansion shells" Marcellin Bruno



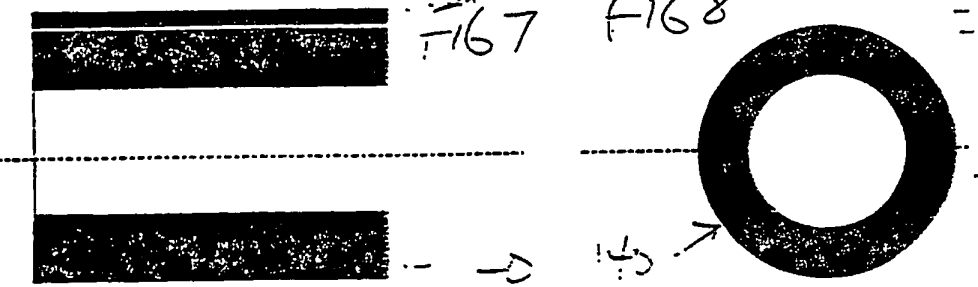
F165 F166

Tube rond en matériel compressible et tube extérieur mince en acier ou autre matériaux

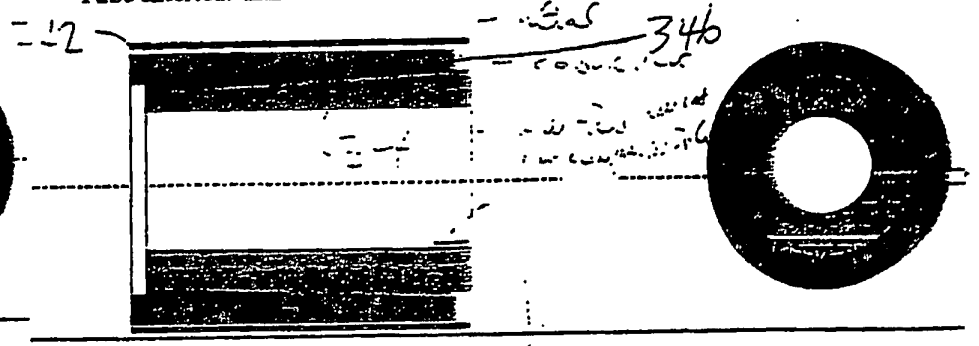


F169 F1610

Tube extérieur rond et conique. en matériel compressible, caoutchouc. polymère. ect
Tube intérieur rond et conique. en matériel peu compressible, acier, polymère. ect . a
Tube extérieur mince fendu en acier ou autre matériaux résistants



F167 F168



F1612

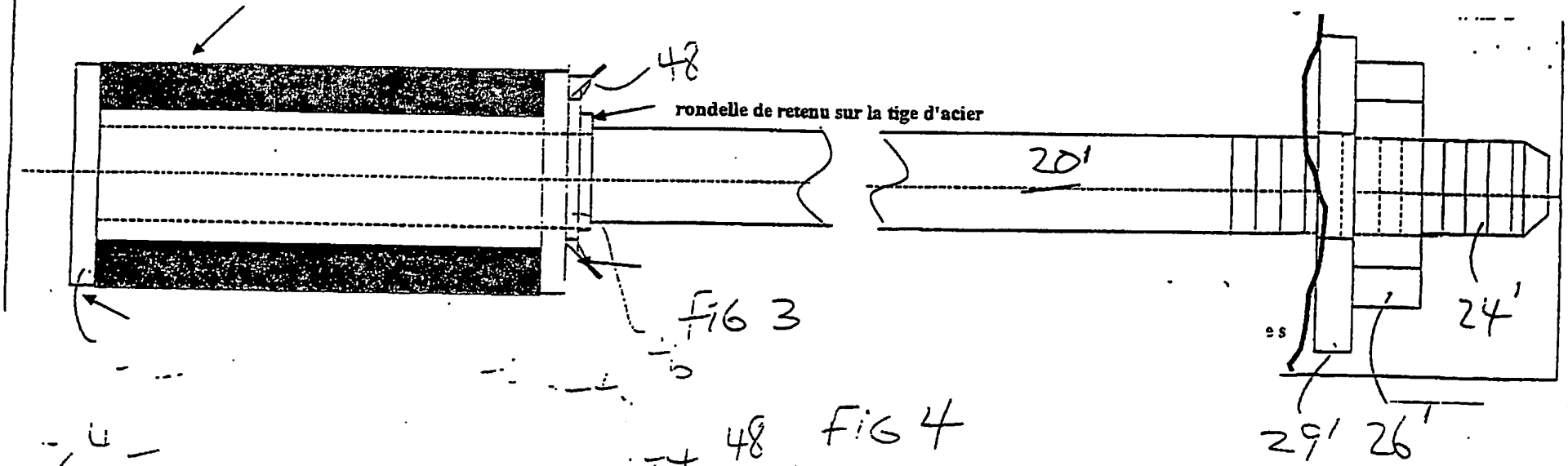

48
rondelle de retenu sur la tige d'acier
20'
24'
29'
26'

Fig 3

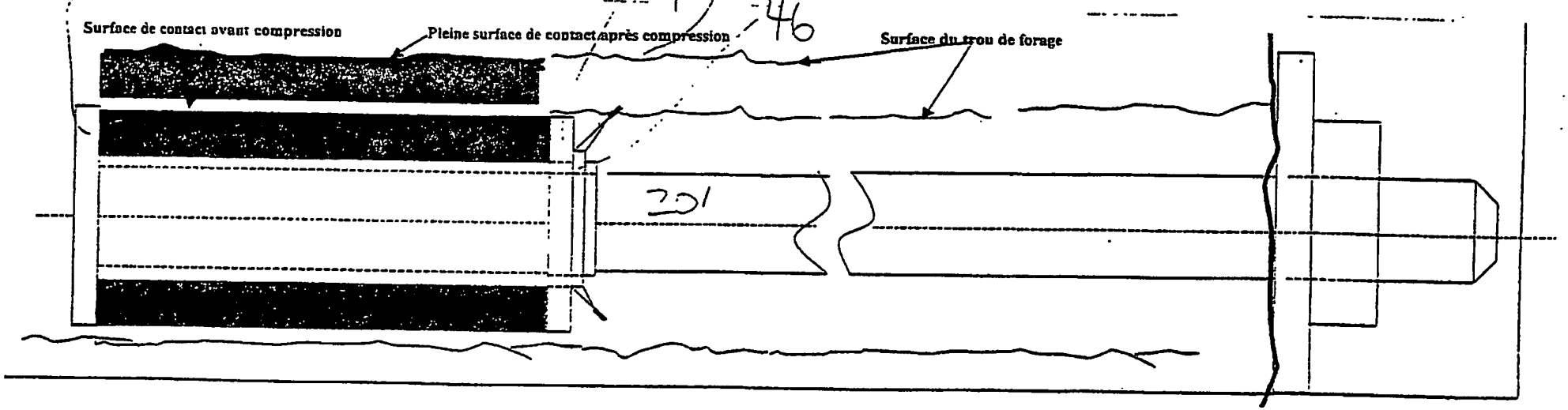

48
46
Surface de contact avant compression
Pleine surface de contact après compression
Surface du trou de forage
20'

Fig 4

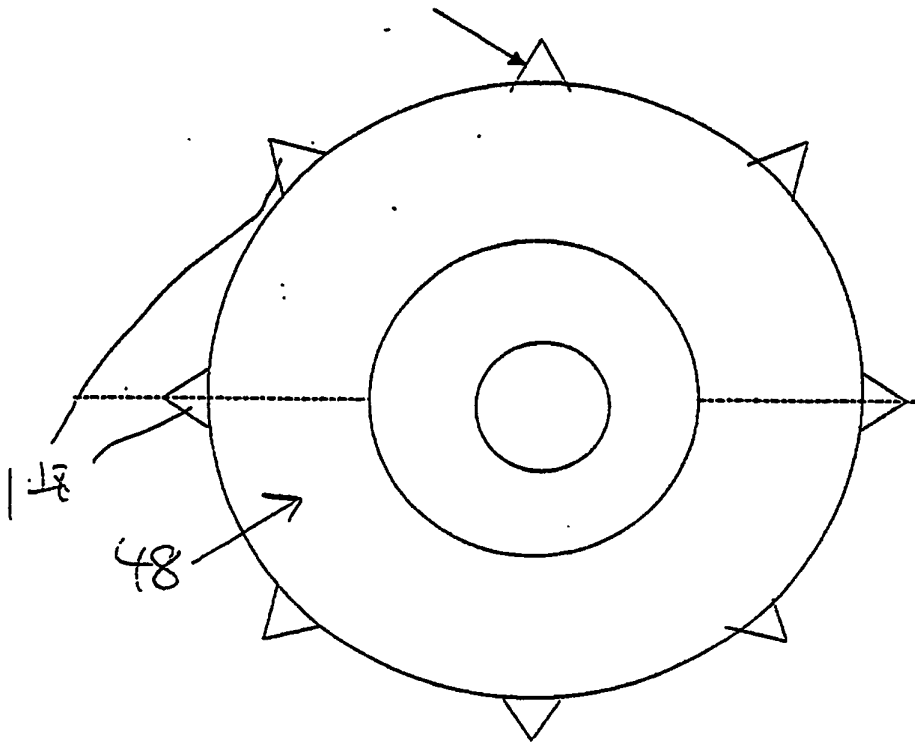


Fig 15

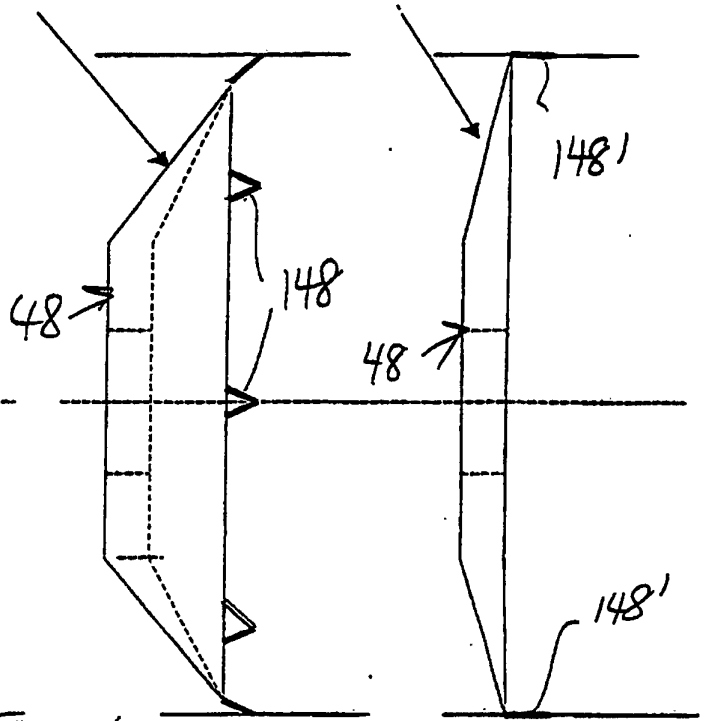


Fig 16

Fig 17

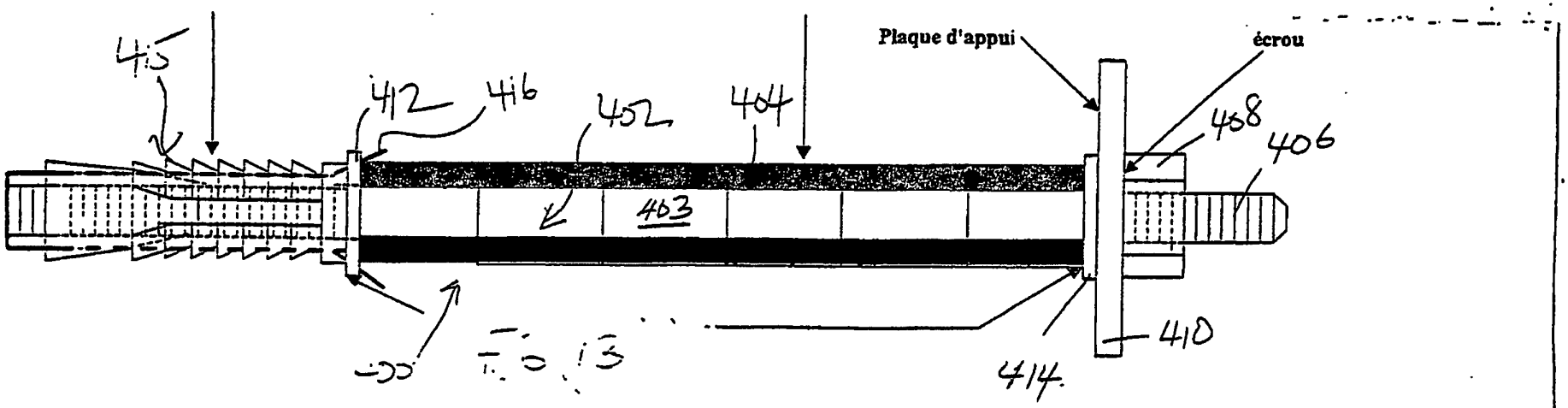

Plaque d'appui
écrou
45
412
416
452
404
458
406
403
410
414
400

Fig 13

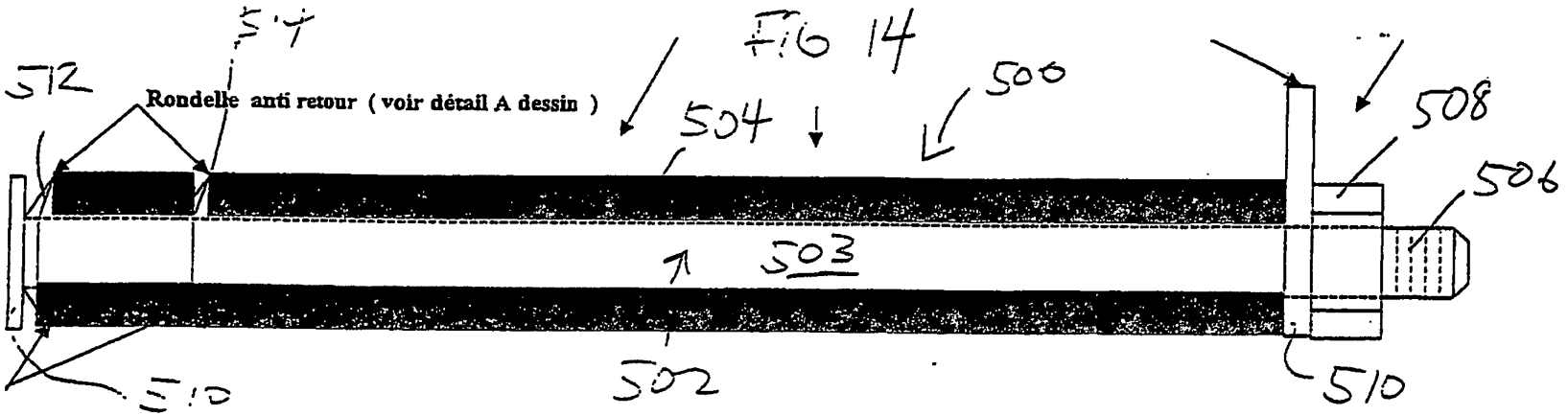

514
512
Rondelle anti retour (voir détail A dessin)
504
500
508
506
503
502
510
510

Fig 14

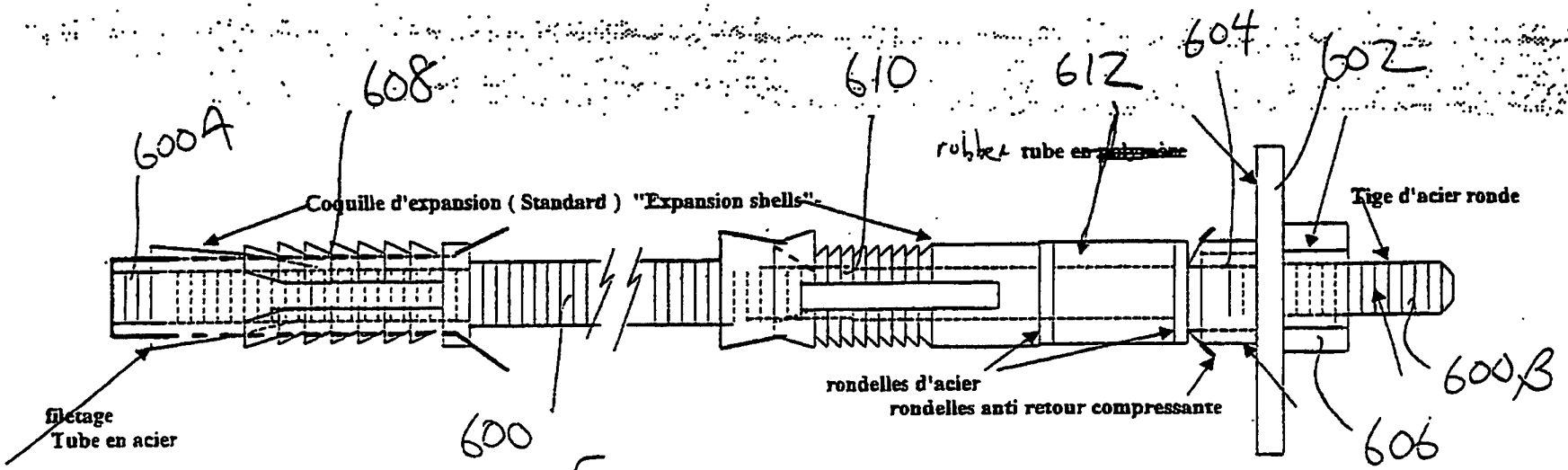

600A
608
610
612
604
602
Coquille d'expansion (Standard) "Expansion shells"
rubber tube en polyuréthane
Tige d'acier ronde
filetage
Tube en acier
600
rondelles d'acier
rondelles anti retour compressante
606
600B

fig 18

Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/CA04/001878

International filing date: 26 October 2004 (26.10.2004)

Document type: Certified copy of priority document

Document details: Country/Office: US
Number: 60/514,004
Filing date: 27 October 2003 (27.10.2003)

Date of receipt at the International Bureau: 23 February 2005 (23.02.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)

World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse